Extraneural Metastasis of an Ependymoma: a Rare Occurrence

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SUMMARY – *Extraneural metastases of ependymoma are very rare, and have been reported in the lungs, lymph nodes, pleura, mediastinum, liver, diaphragmatic muscle, and bone. We describe the radiological findings of pathologically proven lung metastases from an anaplastic ependymoma. The tumor which arose in the posterior fossa was first diagnosed in 2007 when first surgical resection was performed outside our institute. Multiple operations were performed after that due to tumor relapse. Multiple lung nodules were discovered incidentally during a VP shunt survey. Biopsy from the lung nodules displayed identical histomorphology to the primary brain tumor.*

Case Report

A seven-year-old boy was diagnosed with posterior fossa anaplastic ependymoma (WHO III) in 2007 and underwent surgical resection, ventriculoperitoneal (VP) shunt insertion, chemotherapy and radiotherapy outside King Abdul-Aziz medical city. Since then, he had been followed up regularly with the oncology service at our hospital.

Recurrence was noted on an MRI performed in February 2009 (Figure 1) demonstrating a heterogeneously enhancing lesion in the surgical bed posteriorly close to the transverse sinus with an internal non-enhancing component thought to be cystic changes. The patient underwent aggressive surgical resection followed by radiation therapy in December 2009. Following that, the patient was annually screened by MRI for recurrence or disseminated disease.

During December 2012 the patient presented to the ER with a two-day history of headache and vomiting. A VP shunt survey was done and compared to the previous shunt survey done during 2009 (Figure 2) and incidental lung masses were discovered (Figure 3). CT scan was obtained and showed multiple lung lesions, some of which contained internal punctate calcifications, the largest of which was noted in the right lower lobe (Figure 4). The radiographic differential diagnosis was chondroid hamartoma of the lung and metastasis given the history of primary tumor. Six months later in June 2013 a follow-up CT scan showed further growth of the lesions and CT-guided tissue biopsy was obtained and sent to pathology. The pathological section confirmed a diagnosis of ependymoma.

Pathological Findings

Microscopically, hematoxylin and eosin-stained sections show identical histological appearance to the previously resected intracranial ependymoma. There were nodules of viable fibrillary tumor alternating with zones of necrosis. Tumor cells displayed uniform bland nuclei with evenly distributed chromatin (Figure 5A). Subtle perivascular pseudorosettes and rare true rosettes were seen. Immunohistochemically, the tumor cells reacted positively for GFAP and S100 (Figure 5B) while the typical perinuclear dot and ring-like pattern was observed with EMA immunostaining which also highlighted occasional true rosettes. A sample from the paraffin block was processed for electron microscopy which revealed the ultrastructural characteristics of ependymal differentiation. These features included cytoplasmic microlumina filled with microvilli, intercellular junctional complexes and rare cilia.

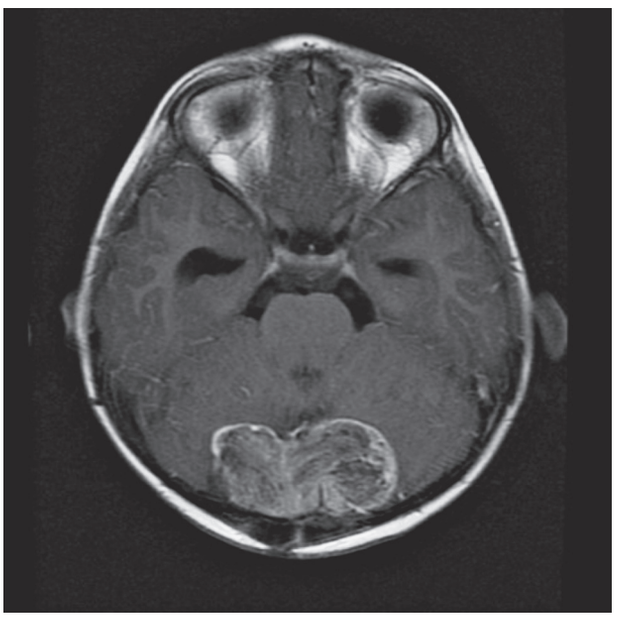


Figure 1 Axial T1 WI post gadolinium shows a heterogeneous enhancing lesion at the surgical bed in the posterior fossa close to the transverse dural sinuses.

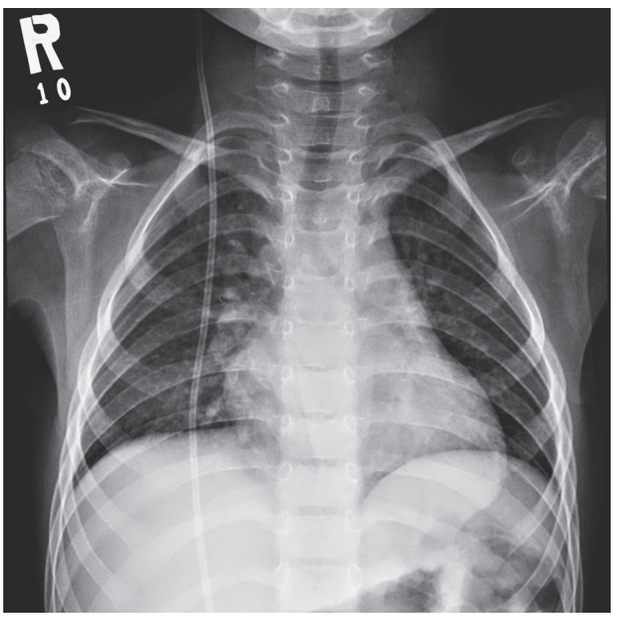


Figure 2 Frontal chest x-ray as part of VP shunt survey shows peribronchial wall thickening without lung mass, consolidation or pleural effusion. The VP shunt is intact.

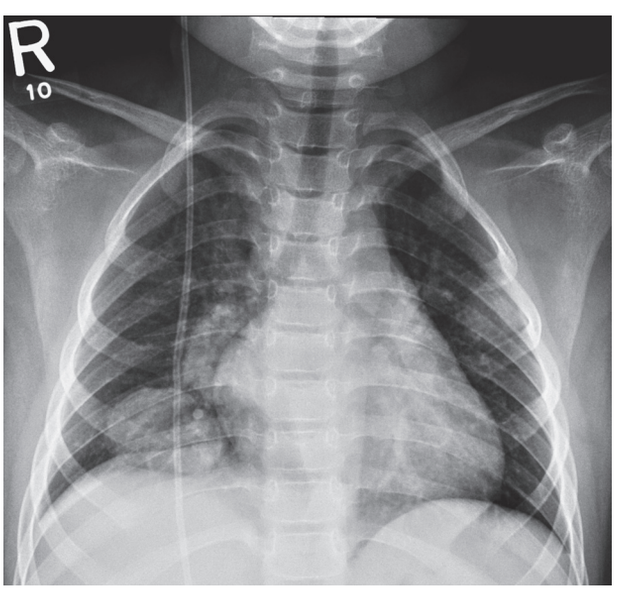


Figure 3 Follow-up frontal chest x-ray shows interval development of bilateral lung lesions, the largest one in the right lower lobe. The cardiomediastinal silhouette is normal.

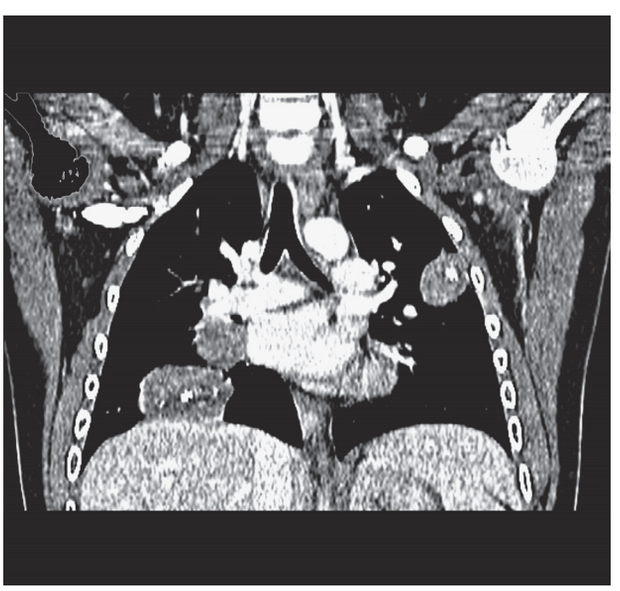


Figure 4 Coronal enhancing chest CT scan confirms the presence of bilateral soft tissue lung lesions with internal punctate calcifications.

Discussion

Ependymomas are rare glial neoplasms comprising 5% of all intracranial tumors in adults and 10% in children. They usually arise intracranially in an infratentorial or supratentorial brain location and less commonly from the spinal cord, but rarely metastasize outside the central nervous system (CNS) [1].

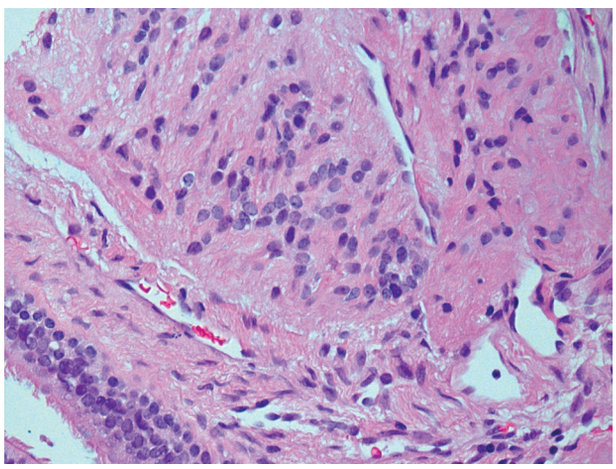
Approximately half the patients with ependymoma will experience recurrent disease [2,3] and the prognosis for these patients is poor. Radia-

tion options following recurrence include focal re-irradiation, stereotactic radiosurgery, or craniospinal radiotherapy for metastatic disease, and have resulted in five-year survival in up to 50% of patients [2,4]. Ependymomas mainly relapse at the primary site and sometimes in the spinal cord within the CNS. They rarely metastasize outside the CNS as extraneural metastases. Metastization to and from the CNS is low due to the unique brain and tumor interaction with the blood-brain barrier, microglia, matrix protein, cytokines and growth factors [1].

The exact mechanism by which brain tumors metastasize outside the CNS is not known. There are a number of theories on the mechanism of distant metastasis. It is generally thought that the dissemination of tumor tissue results from invasive surgery such as craniotomy, in which tumor cells penetrate the scalp and gain access to the blood or lymph system [5]. One hypothesis postulates that craniotomy and shunt surgeries may contribute to extraneural metastases by disrupting the blood-brain barrier and promoting vascular seeding to distant sites, though not all patients with CNS tumors with extraneural metastases have had prior surgery [7,8]. Another hypothesis suggests that extension of the tumor into the cranial structures may allow seeding into the lymph system [7].

Extracranial metastases of intracranial ependymoma to the lungs are rare. This could theoretically be attributed to invasion of the dural venous sinuses or through direct spread after implantation of an atrioventricular shunt [9].

In our patient there was evidence of focal anaplasia in the recurrent tumors close to the transverse sinus which probably imparted a locally aggressive behavior and subsequent permeation of dural venous sinuses.



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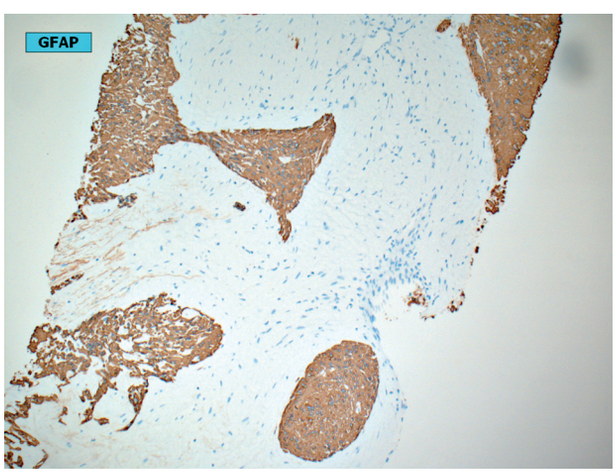

B

Figure 5 A) Uniform tumor cells within a fibrillary background subtly aggregating next to a blood vessel. B) Diffuse GFAP immunostaining highlights metastatic tumor nodules.

References

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